Abstract Submitted
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Coherent Imaging Spectroscopy of a Quantum Many-Body Spin System[1] JACOB SMITH, CRYSTAL SENKO, PHIL RICHERME, AARON LEE, (JQI) Joint Quantum Institute, University of Maryland Dept. of Physics and NIST, College Park, Maryland 20742, WES CAMPBELL, Dept. of Physics and Astronomy, University of California, Los Angeles, CA 90095, CHRIS MONROE, JQI, UNIVERSITY OF MARYLAND TRAPPED ION QUANTUM INFORMATION GROUP TEAM — Trapped-ion quantum simulators are a promising candidate for exploring quantum-many-body physics, such as quantum magnetism, that are difficult to examine in condensed-matter experiments or using classical simulation. We demonstrate a coherent imaging spectroscopic technique to validate a quantum simulation [1]. In this work, we study fully-connected transverse Ising models with a chain of up to 18 $^{171}Yb^{+}$ ions. Here, We resolve the state of each spin by collecting the spin-dependent fluorescence on a camera in order to map the complete energy spectrum and fully characterize the spin-spin couplings, while also engineering entangled states and measuring the critical gap near a quantum phase transition. We expect this general technique to become an important verification tool for quantum simulators.

[1] C. Senko, et al, arXiv:1401.5751 (2014).

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